

A Systematic Review of Literature on Effectiveness of Training in Emergency Risk Communication

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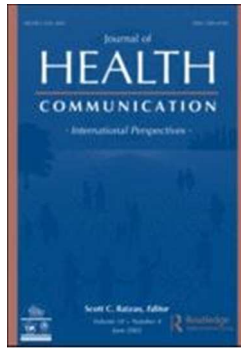
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A Systematic Review of Literature on the Effectiveness of Training in Emergency Risk Communication

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Abstract

Although disaster preparedness training is regularly conducted for a range of health-related professions, little evidence-based guidance is available about how best to actually develop capacity in staff for conducting emergency risk communication. This article presents results of a systematic review undertaken to inform development of World Health Organization guidelines for risk communication during public health and humanitarian emergencies. A total of 6,720 articles were screened, with 24 articles identified for final analysis. The majority of research studies identified: were conducted in the United States, were either disaster general or focused on infectious disease outbreak, involved in-service training, and used uncontrolled quantitative or mixed method research designs. Synthesized findings suggest that risk communication training should include a focus on collaboration across agencies, training in working with media, and emphasis on designing messages for specific audience needs. However, certainty of findings was at best moderate due to lack of methodological rigor in most studies.

Keywords: emergency risk communication, risk communication, systematic review, in-service training, staff development, exercise

Although disaster preparedness training is regularly conducted for a range of health-related professions including nursing (Hsu, et al., 2004; Jose & Dufrene, 2014), veterinary medicine (Dunning, et al., 2009), and healthcare workers in general (Williams, et al., 2008), little evidence-based guidance is available about how best to actually develop capacity in staff for conducting emergency risk communication. This dearth of evidence about training effectiveness is all the more concerning because scholars agree there is a loss of information that occurs between training and on-the-job performance (Arthur, Bennet, Eden, & Bell, 2003; Chiaburu & Marinova, 2005). As part of the process of developing a set of guidelines about risk communication during public health and humanitarian emergencies, the World Health Organization (WHO) Department of Communications' Communication Capacity Building Unit issued a request for proposals for systematic reviews of existing evidence addressing questions about 12 aspects of emergency risk communication. This article reports findings for one of those review topics: how best to develop and sustain emergency risk communication staff capacity.

Existing Systematic Reviews

The WHO guidelines for the project required an initial search be conducted for existing systematic reviews, and any existing reviews be evaluated for quality using the Assessment for Multiple Systematic Reviews (AMSTAR) tool (Shea, et al., 2007). Reviews judged to be low quality were to be excluded from consideration. Two existing systematic reviews were located that addressed communication as at least one component of emergency preparedness training (Potter, et al., 2010; Subbarao, et al., 2008). Independent AMSTAR guided assessment by two researchers indicated both reviews were of low quality as per the tool, and therefore findings are not discussed here.

Some sense of the current state of evidence may be inferred, however, from systematic reviews of the broader literature on training in disaster preparedness and response. Researchers have concluded evaluation of disaster preparedness efforts is usually not scientifically rigorous (Hsu, et al., 2004; Jose & Dufrene, 2014; Williams, Nocera, & Casteel, 2008). Methods used for evaluation are heterogeneous and often not well-described (Beerens & Tehler, 2016). Most studies reviewed in Beerens and Tehler’s (2016) scoping review, for example, did not provide an explanation of why their training format made sense or why they selected a specific evaluation method over others. Few standardized assessment tools exist (Gallardo, et al., 2015), and control groups are rarely used (Williams, Nocera, & Casteel, 2008). This makes it difficult to determine whether anecdotal success of drills, workshops, courses, and other types of training can translate into actual additional skills and knowledge. Also worth noting in the broader literature is that published evaluations of disaster preparedness training and staff development are to a great extent confined to the United States, meaning that even if research designs were more robust, findings might not necessarily be applicable in other national contexts.

It is not clear whether research on staff development in emergency risk communication (ERC) is characterized by the same weaknesses as disaster preparedness literature in general. Furthermore, although training in ERC may be conducted concurrently with broader disaster simulations, workshops, or courses, it is a distinctive skill set which may require different pedagogies. There is need, therefore, to evaluate the state of the evidence.

Method

Approach to Searching

This systematic review took place in two phases: 1) a systematic knowledge mapping exercise to identify primary studies and grey literature reports that map against the research

question and make clear the geographical spread of evidence. The systematic knowledge mapping was conducted in line with SCIE systematic mapping guidance (Clapton, Rutter, Sharif, 2009); 2) Quality appraisal and evidence synthesis of relevant studies identified in the knowledge mapping phase.

Data Sources

Literature review for the knowledge map included searches in over 20 academic and grey literature databases. Academic databases searched were: Applied Social Sciences Indexes and Abstracts (ASSIA), Business Source Premier, CINAHL, Cochrane Central Registry of Controlled Trials, Cochrane Database of Systematic Reviews, Communication and Mass Media Complete (EBSCOhost), Communication and Mass Media Complete (Gale), ERIC, MEDLINE, PAIS, PsycInfo, Sociological Abstracts, Web of Science (SSCI and SSI databases), and the WHO Global Library (LILACS, WPRIM, IMEMR, IMSEAR databases). In order to locate literature from low and middle income countries, we did not restrict the search to specific languages. Additionally, we searched databases in Arabic (Dar Almandumah –Human Index), Chinese (China Academic Journals), Russian (Russian Science Citation Index), French (Cairn.Info communication database), and Spanish (SciELO; LILACS). Altogether records were identified in 16 languages (Arabic, Castilian, Chinese, English, French, German, Italian, Japanese, Moldovan, Portuguese, Romanian, Russian, Serbo-Croatian, Slovak, Spanish, and Turkish).

We also searched the following grey literature sources: Defense Technical Information Center (DTIC), GreyLit.org, Open Grey, and PubMed. In addition to grey literature electronic databases, searches were performed at Booz Allen Hamilton, Communication Initiative, and Milbank Memorial Fund sites. To further ensure representation from low income and fragile

states we also reached out to 47 international health, risk, and crisis experts for information on additional resources.

Electronic Search Strategies

Using a Boolean approach, we searched for overlap of three distinctive realms of subjects in the literature: a) disaster/emergency preparedness, b) communication/risk communication, and c) staff development/capacity building/training/education. Specific search strategies and terms were tailored for each individual database. For each separate database searched we consulted the database thesaurus for subject terms. We also allowed words to be “exploded” to locate additional synonyms and related terms. Grey literature was searched in similar fashion, when possible. Some grey and non-English databases did not allow for a Boolean search strategy so these were searched with broader terms.

Additionally, ancestry and forward citation searching was performed on all identified relevant articles. Articles that either were cited by such studies or which cited the highly relevant article were located in Web of Science Citation Index, Social Science Citation Index, or Google Scholar. Reference lists of systematic reviews were also combed for primary research studies relevant to the objective of the current review. To ensure that no articles remained uncaptured, additional subject headings and keywords were derived from articles found through ancestry and forward citation searching, as well as previously unexplored controlled vocabulary and keywords located in other core articles. In this way, searches were re-run including new keywords and subject terms in MEDLINE and Communication and Mass Media Complete (EBSCO). As per directions from WHO personnel, only literature published since January 1, 2003 was examined.

A total of 6,181 records were retrieved from academic literature searches; 436 records were located in grey literature searches; and forward and backward ancestry searches and

searches of references of systematic reviews yielded 99 records. Four documents were identified by searching tables of contents of special issues identified in the original searches.

Study Screening Method

The article selection process took place in several stages. The process is displayed in Figure 1. After initial titles were pulled, articles were screened for relevance at each stage by two team members working independently. For ambiguous cases, decisions were made through discussion. Articles were judged for relevancy according to the inclusion and exclusion criteria. Studies that were judged to have direct relevance (i.e., directly mapped onto phenomenon of interest); indirect relevance (i.e., corresponded with some aspects of the phenomenon of interest); partial relevance (i.e., a part of the issue of interest or population was addressed but not all); or unclear relevance (i.e., unclear whether underlying data were relevant) with the review topic (Lewin, et al., 2015) were selected for extraction of key findings. (A list of all full-text studies examined and search strategies applied for each database can be obtained from the corresponding author.)

Inclusion and Exclusion Criteria

Because it was anticipated that few randomized controlled trials would exist on the topic, a broad methodological net was cast, including studies that employed a range of qualitative, quantitative, and mixed-method research designs. The following broad inclusion criteria were applied:

- research related to developing or sustaining capacity of ERC staff for preparation and response to disaster, OR
- research that included ERC as part of a larger emergency preparedness training or staff development effort.

The following exclusion criteria were applied:

- research about ERC that did not describe specific training, education, core competencies, or other interventions to develop or sustain staff capacity;
- studies involving formative research to identify ERC staff training needs without actual implementation of specific training, education, core competencies, or other interventions to develop or sustain capacity;
- research about training in emergency preparedness or related subjects that made no mention of ERC or communicating with the public;
- essays, opinion pieces, or descriptions of trainings or education that were not research-based, i.e. did not include some type of data collection designed to assess outcomes; and
- studies published before 2003.

*****Insert Figure 1 About Here*****

Data Extraction for Knowledge Map

Two team members coded key descriptive characteristics of all included articles individually. They then came together and discussed every data point. Disagreements in coding were resolved by discussion. Articles were coded for: type of intervention (i.e., in-service training, undergraduate or graduate university-level training, development of core competencies, development of tools for evaluation); country in which staff development took place; type of disaster; phase of crisis (see Reynolds & Seeger, 2005); and research method of study (i.e., randomized controlled trial, observational quantitative, qualitative, mixed-method, case study, pre-post studies with no control group, instrument development).

Quality Appraisal

Appraisal Items

All studies selected for evidence synthesis were appraised individually by two ERC experts on the research team. Researchers compared appraisals for each article and disagreements were resolved by consensus. Quality of individual studies was appraised differently depending on study design. The following tools were used, as recommended by WHO personnel:

- Observational quantitative studies: Modified version of the British Medical Journal Critical Appraisal Checklist for Questionnaire Studies (BMJ, 2016)
- Qualitative studies: Critical Appraisal Skills Program (CASP, n.d.)
- Mixed-method studies: Mixed Methods Appraisal Tool (MMAT, Pluye, et al, 2011)
- Case studies: MMAT
- Before-after (pre-post) studies with no control group (National Heart, Lung, and Blood Institute Quality Assessment Tool, 2014)
- Instrument development: COSMIN Checklist (Consensus-based, 2014)

Synthesis of Findings

Synthesis was done in two stages. First, findings from individual studies were synthesized within each of the three methodological streams: mixed method and case studies, qualitative studies, and quantitative studies. Findings within each stream were synthesized using a Framework Synthesis approach (Petticrew, et al., 2013). We also employed thematic analysis wherein patterns emerged inductively via repeated content analytic passes through the studies (Lindlof & Taylor, 2002). After patterns were identified, they were combined and catalogued into categories. Synthesis of findings was done by ERC experts on the team. Conclusions were drawn individually and then discussed among the three lead researchers. Synthesized findings from mixed method, case studies, and qualitative studies were evaluated for certainty/confidence

using an adapted version of the GRADE CERQual tool. Quantitative-descriptive survey and pretest-posttest studies with no comparison group were appraised by applying the principles of GRADE.

In the second stage of synthesis, findings within each methodological stream were compared and contrasted with findings from the other streams. These findings were analyzed thematically for potential modifications to the across-method findings. That is, findings from the different methodological streams were systematically merged and condensed into several findings that were represented consistently across methodological streams.

Results

Key Characteristics of Selected Studies

Key descriptive characteristics of the studies are presented in Table 1. Data are actually much less geographically distributed than the table suggests, however, because most of the data on interventions in Asian, African, and Middle Eastern nations were derived from a single article that reported the results of multiple training programs across the three regions.

*****Insert Table 1 About Here*****

Relevance and Quality Appraisal of Selected Studies

Fewer than one-third of the 24 studies analyzed were directly relevant to the review objective. The remaining studies were classified as indirectly relevant because they described ERC training as a small component of broader emergency preparedness training for healthcare personnel who were not ERC staff, or they reported development of an evaluative instrument of which one component dealt with ERC.

Quality of studies varied. Some studies were judged to be of high or moderate quality based on appropriate tool assessment, but many were assessed as low quality because they

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3 depended upon a few self-reported assessments of learning or skills acquisition and did not
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5 employ any performance or direct knowledge measures. University courses sometimes assessed
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7 knowledge on final exams or projects. No studies we located used comparison or control groups
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9 of any type. In addition, many of the quantitative studies did not give any attention to concerns
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11 about reliability, validity, or pilot testing. Long term effects were not measured. Specific
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13 information about each study is presented in Table 2, including a description of the capacity
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15 building/training and findings regarding effectiveness.
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20 *****Insert Table 2 About Here*****
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22 **Synthesis of Findings Within and Across Methodological Streams**

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24 We conducted separate evidence synthesis procedures within each methodological stream
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26 before joining evidence for all streams into a single set of findings. However, because of space
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28 limitations we present only the evidence synthesized across streams (Table 3). The left-hand
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30 column summarizes each finding and the overall direction of evidence. The right-hand column
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32 indicates the technique used for evaluation of the synthesized findings within each
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34 methodological stream that contributed to that finding, as well as the quality appraisal of
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36 evidence.
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41 *****Insert Table 3 About Here*****
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43 Two themes arose that may be held with a moderate level of confidence. First,
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45 coordination and collaboration were mentioned in nearly all of the articles included in the mixed
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47 method/case study and qualitative methodological streams. This coordination and collaboration
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49 focused primarily on three aspects. First, special attention was devoted to identifying essential
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51 parties within each organization or agency included in the training exercises and to assessing the
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53 quality of these relationships during the exercises. Second, coordination and collaboration among
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agencies within countries were evaluated. Third, and less commonly, collaboration internationally was assessed where multiple countries were involved in the training exercise. Regardless of whether the focus was within the organization or agency or among organizations and agencies, establishing communication networks in advance of a crisis was a frequently mentioned as a recommendation.

Second, communication with external audiences was a prevalent theme. External communication included a focus on both communication channels and adaptation of messages to address the distinct needs of vulnerable and under-represented populations. The primary focus of most exercises, however, was on internal and inter-agency communication within pre-identified networks. Although internal communication is essential, a concern mentioned frequently in this theme is that there is little training for effective external communication to various publics, and in particular training geared to dealing with media houses and journalists.

Discussion

This WHO-commissioned evidence synthesis focused on research that addresses how to effectively develop and sustain ERC staff capacity for preparedness and response. A total of 24 relevant studies were identified, appraised for quality, and used for data extraction. The majority of studies found were based on exercises involving tabletops, simulations, and, in a few cases, coursework or workshops. Overall, most studies reviewed concluded that tabletop exercises and simulation for training can enhance awareness, readiness, and knowledge about emergency risk communication. This was the case in studies conducted in the U.S. (e.g. Aertsen et al., 2013; High, et al., 2010; Morris, et al., 2012), Sweden (Sandström, Eriksson, Norlander, Thorstensson, & Cassel, 2014), Norway (Wahl, Willumsen, Jensvoll, Finstad, & Berglund, 2015), and also

multi-national exercises conducted across the Middle East, Asia, and Africa (Dausey & Moore, 2014).

Findings synthesized across methodological streams indicated several major features required for successful ERC training. First, exercises should be focused on coordinating across agencies. A report of 31 tabletop exercises conducted with U.S. state and local health departments (Dausey, Buehler, & Lurie, 2007) concluded that exercises should be designed collaboratively with input from health departments and participating outside agencies. However, many of these same agencies did not have established relationships with community leaders or organizations that could serve as messengers or communication channels (see also Lurie, Dausey, Knighton, Moore, Zakowski, & Deyton, 2008). In several states, law enforcement and EMS personnel had greater familiarity and were more trusted than public health agencies, while local and state government agency personnel deferred to, but mistrusted, federal officials (Malet & Korbitz, 2015). Similarly, evidence from the Middle East, Asia, and Africa indicates that coordination across countries can produce successful exercises (Dausey & Moore, 2014), but that participants in these countries said more sectors should have been involved.

If coordination between community and public health agencies was recognized as an important component of training exercises, that principle rarely extended to coordination with media. In study after study with state and local health departments in the United States and other agencies, preparedness for media relations was found to be low (Dickman, et al., 2015; Heideman & Hawley, 2006; High, Lovelace, Gansneder, Strack, Callahan, & Benson, 2010; Malet & Korbitz, 2015; Morris, et al., 2012). This pattern was also evident in an assessment of hospital preparedness for the 2010 FIFA World Cup in South Africa (Valesky, et al., 2011), which found preparedness for risk communication and public relations to be among the lowest

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areas assessed. Few departments studied were proactive in their contacts with media. Most waited until they were contact to start communicating with the public, meaning they often responded defensively and had trouble quickly formulating an initial message that was clear, informative, and alleviated anxiety (Dausey, et al., 2007). This problem became all the more glaring when exercises were conducted in real time. Freimuth, Hilyard, Barge, and Sokler’s (2008) real time exercise, for example, revealed that participants could not always translate knowledge of principles into actions under time pressure, especially expression of empathy and minimizing of bureaucratic speech. Talking points were not shared with hospitals and other agencies, and participants did not adequately monitor media developments. Notification lists were often used indiscriminately, needed auditing for current details, and typically would have been unusable by back-ups in their current format. We highlight Freimuth et al’s observation that because tabletops attempt to create a comfortable environment, inclusion of media may be perceived as threatening. Without it, however, critical gaps in planning will not be revealed.

A similar theme across studies was that training in ERC should include preparation for designing messages to sensitive to audience needs and comprehension, especially for special needs and vulnerable populations (Carney, et al., 2011; Friedman, et al., 2011; Heideman & Hawley, 2007; Madden, et al., 2013). Some of the issues raised were quite basic. For example, a real-time risk communication simulation in the U.S. (Freimuth, et al., 2008) noted that in response to a request from a local pastor for Spanish language material, although most local health departments had material available, only about one-third had a process in place for translating English material into Spanish.

The above findings come with major caveats. As with emergency preparedness training more broadly (Beerens & Tayler, 2016; Gallardo, et al., 2015; Williams, et al., 2008) limitations

in methodological rigor, relevance, and adequacy of data for most findings were moderate to severe. Among the prescriptive findings identified in the review, only the suggestions that exercises should focus on coordination across agencies and incorporate training in media can be held with even a moderate level of confidence. Published evaluations of emergency risk communication training are mostly confined to the United States, meaning that even if research designs were more rigorous, findings might not necessarily be applicable to other national contexts.

Some confidence can be placed in descriptive findings about current norms in ERC training. Synthesis across all methodological streams indicates current trainings generally do not employ after action reports in a way that can promote generalized learning, contain little instruction on using social media, are mostly disaster-general, almost never employ blended online and face-to-face formats, and rarely include training in evaluation. Because these findings are descriptive, however, they can only suggest directions for future research. Separate investigations will have to be undertaken to determine what influence each of these factors has on actual ERC skills.

Limitations

Although considerable effort was dedicated to searching grey literature and international data bases for this review, the possibility remains that some description of efforts to enhance staff ERC capacity exists in low and middle income countries using formats not discovered in this review. However, it is worth citing one of the few studies we located that reported results from other than high-income nations: “The results [of exercises outside of the United States] may be reported directly to exercise participants but often don’t make it to the scientific literature. If the results from exercises are published in any systematic way, they often get published in in-

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house publications for domestic audiences. . . The incentives, financial or otherwise, for researchers to turn these in-house publications into scientific papers are limited” (Dausey & Moore, 2014, p. 476).

Additionally, although the multi-tiered method used in this study enables us to synthesize findings from studies using a wide range of data collection methods, no guidance yet exists for how to make a final assessment of the quality of evidence across all methodological streams.

Gaps in Existing Research

The main gap evident in the reviewed literature is an overwhelming lack of focus on emergency risk communication. That is, emergency, risk, and crisis research may include communication as a single piece of a much broader analysis but rarely treats it as the primary dimension of research interest. Thus, existing evidence on how best to develop and sustain capacity in ERC staff is thin, and it is difficult to avoid concluding there has been a lack of interest in determining factors that contribute to training effectiveness. Beyond this, gaps in the currently available evidence can be categorized into two major issues: lack of diversity in context and lack of methodological rigor.

Diversity of Context Issues

Inadequate diversity of populations studied. There is a lack of research focus on diverse populations (e.g., international, cultural, religious, underserved). Research is primarily from the United States, and secondarily from Europe. This is a serious loss to our knowledge base. Low and middle income nations are increasingly recognizing the importance of being able to respond quickly and effectively to public health emergencies, and evidence about training techniques gathered in high-income contexts may not transfer well.

Inadequate diversity of organizational contexts. Our findings indicate a focus on collaboration between agencies is an important element of training, and indeed many studies reported on ERC preparedness training that involved multiple organizations. However, there is an anemic spread across organization types. Many studies were hospital-based or included hospital personnel. A substantial number included participants from state and local health departments, but fewer included involvement of federal agencies. Very few incorporated participation of community- or faith-based organizations on the ground.

Little diversity of hazard specific trainings. The bulk of studies identified either focused on infectious disease outbreaks or were disaster-general in nature. The all-hazard approach trains for generic events so as to avoid the need to endlessly exercise about every possible risk factor. However, it is not why infectious disease outbreaks would require hazard specific training for emergency risk communication, whereas exercises centered on terrorist incidents and chemical and nuclear threats were much less common. Natural disasters such as fires, floods, hurricanes, tornados, and volcanos were not represented at all in the studies synthesized.

Methodological Issues

Few behavioral outcome measures. By far the largest proportion of studies used self-reported measures of changes in awareness, knowledge or skills to evaluate the success of the interventions. Most were in the form of Likert-type items, sometimes observed both pre- and post-exercise, often post-exercise only. Performance indicators were rarely used (exceptions were Freimuth, et al., 2008, and Valeskey, et al., 2011), and few attempts were made at developing assessment rubrics (for exceptions see Savoia, et al., 2009; Palttala & Vos, 2011).

No long-term or comparative outcome assessment. Existing research is short term and cross sectional. Long-term changes in ERC skills were not measured, even though the ultimate

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goal of training in ERC must be to increase skills and resources for the long haul. Furthermore, no studies identified in this review employed any type of comparative design.

Little organizational-level assessment. The preponderance of studies assessed in this review measured individual gains in ERC preparedness. Gains in ERC capacity at the organizational level were rarely assessed. Organizational-level indicators like staff satisfaction, turnover, and retention were not investigated in any of the studies.

Lack of purposeful/actionable recommendations. Attention was given to describing activities rather than to designing studies that would produce generalizable, actionable recommendations for similar training exercises. Evaluation of any sort frequently appeared to be an afterthought. A few studies evaluated the pedagogical value of the exercises they used and made generalizable recommendations, but they were the exception.

Conclusion

This report provided an overview of extant research focused on effectively building emergency risk communication staff capacity for preparedness and response. Unfortunately, much research on this topic fails to focus on communication processes and the literature suffers from serious contextual and methodological limitations. However, this review has used existing literature to parse out meaningful findings, identify priority research gaps, and outline specific recommendations for future research. These recommendations have been used to inform guideline development at the WHO and may provide pathways to more meaningful, broadly applicable, and diverse research to positively affect global public health.

List of Articles Included in Evidence Synthesis

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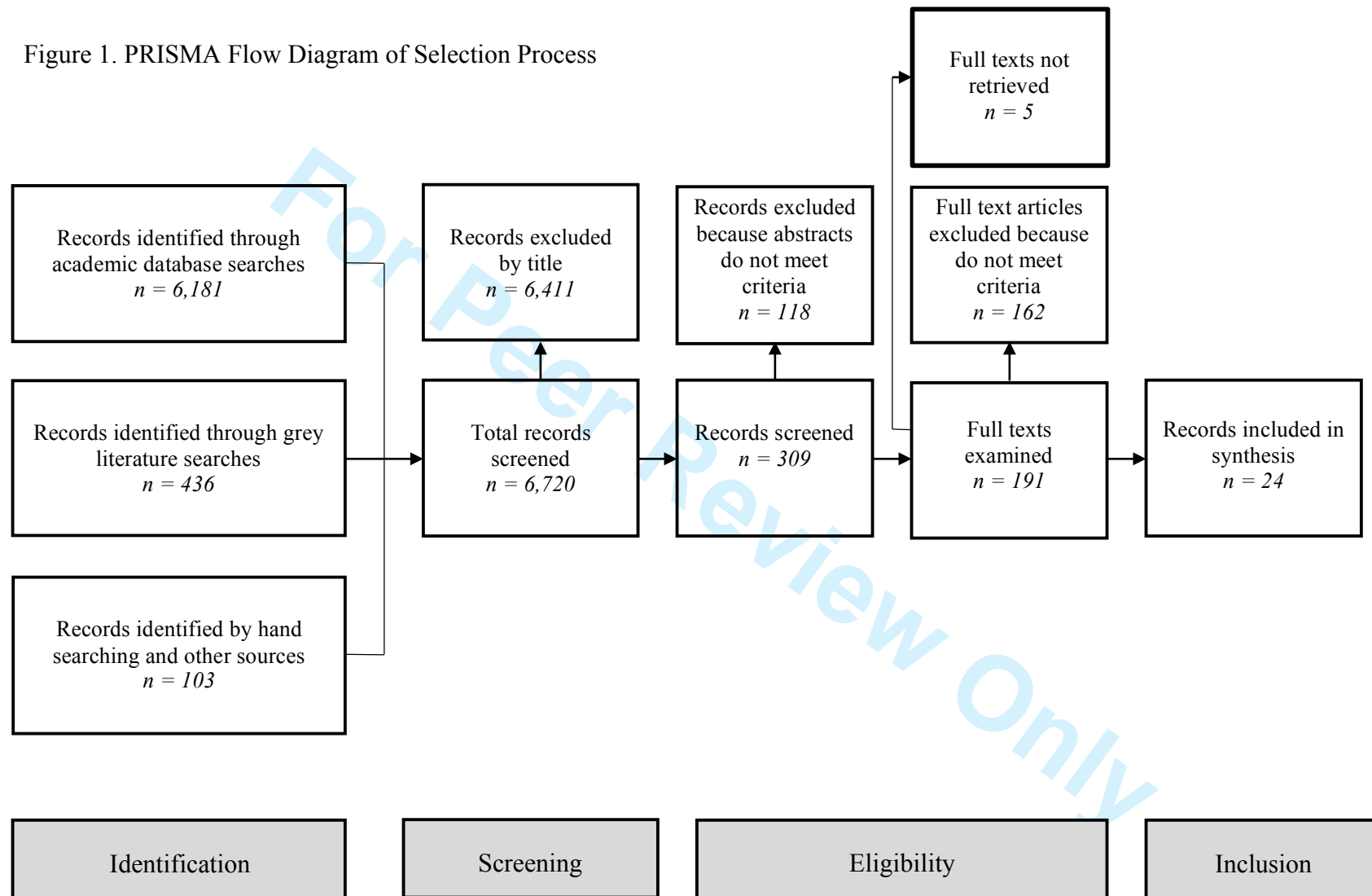
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Figure 1. PRISMA Flow Diagram of Selection Process



(Moher, Leberati, Tetzlaff, Altman, The PRISMA Group, 2009)

Table 1. Key Characteristics of Selected Primary Studies

Country Focus*					*Numbers in these categories do not add up to 24, because some studies focus on more than one country, type of staff development, or disaster phase. Most of the data
Africa	Asia	Europe	Middle East	North America	
Burundi – 1	Cambodia – 1	Belgium – 1	Israel – 1	United States	
Kenya – 1	China – 2	Europe (general) – 2	Jordan – 1	- 16	
Rwanda – 1	Lao PDR – 1	Finland – 1	Palestine – 1		
South Africa - 1	Myanmar – 1	Norway – 1			
Tanzania – 1	Thailand – 1	Sweden – 1			
Uganda – 1	Vietnam – 1				
Type of Staff Development*					
In-service training - 17	Education - 5	Instrument development - 2			
Type of Disaster					
Infectious disease outbreak - 9	Bioterrorism - 2	Food - 2	Other: Terrorism, Chemical/nuclear, Stadium crush - 3	General - 8	
Organizations Involved					
Hospitals - 2	Universities - 5	Federal/national government - 2	State/local government - 3	Multiple - 12	
Disaster Phase(s)*					
Preparation - 12	Response - 20	Evaluation - 5	Unable to determine - 1		
Research Method					
Case study using Questionnaire – 10	Mixed methods –6	Qualitative - 6	Instrument development – 2		

interventions in Asian, African, and Middle Eastern nations, for example, were derived from a single article that reported the results of multiple training programs across the three regions.

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Table 2. Characteristics, Relevance, and Quality of Included Studies

Study Citation	Description of Intervention/Training/ Education	Method of Evaluation of Effectiveness and Findings*	Quality Assessment (appraisal tool used)
Mixed Method Studies			
Ablah, et al., 2007	<i>Month-long real-time pilot exercise.</i> Purpose: to determine if exercise format would be useful for increasing self-reported abilities with regard to surge capacity, coordination between state and local partners, risk communication, disease investigation protocols and procedures. A simulated outbreak of an undisclosed infectious disease was conducted in six counties in Kansas, U.S.A., using electronic media, which allowed participants to work from their health department offices as they would in a real incident.	<i>Pretest-posttest no control group.</i> Pre- and post-exercise 5-point Likert-type scales. On a single item, respondents rated own abilities to “implement risk communication skill set.” Findings were ns.	(NHLBI tool) Moderate
Aertsen, et al., 2013	<i>4-week graduate student project.</i> Purpose: to give Belgian MBA students opportunity to translate theory into practice in a crisis situation. Students were urged to use linguistic and communication theory to manage communication in a simulated crisis at university. After week 2 worked in heterogeneous crisis communication teams. 7 roles identified. 4 crises were simulated.	<i>Case study.</i> Closed-ended 11-item, Likert-type 5-point scale, with 1 = strongly agree to 5 = strongly disagree. Answers to open-ended questions also recorded. Examined student wiki and discussion board assignments. Although they made errors, the simulation enabled students to move beyond mechanistic use of communication axioms and deepen their understanding of theory.	(MMAT) Low
Dausey & Moore, 2014	<i>Tabletop exercises.</i> Purpose: not clear. Exercises presented participants in Middle Eastern, Asian, and African countries with a future scenario that involved an unfolding pandemic influenza crisis at different stages. Required to respond with actions they would take if scenario actually occurring. Expert facilitators given discussion points and probes.	<i>Mixed method.</i> 6 exercises used 5 Likert-type questions rating on 5-point scale as well as qualitative questions, After Action Reports, and interviews of experts. Exercises raised awareness and understanding, assisted in evaluating plans and identifying priorities for improvement, and enhanced preparedness and response capabilities across sectors and countries.	(MMAT) Low
Freimuth, et al., 2008	<i>4-hour simulation.</i> Purpose: to determine how risk communicators across the state of Georgia, U.S.A., measured up to key deliverables: verification procedure; public media statement; hospital	<i>Case study.</i> Evaluated inputs as received from participants during exercise according to checklists. Multiple performance standards checked each hour. Local risk communicators had much greater difficulty	(MMAT) Moderate

	public information officer inquiry role-play including call content and follow-up, 24-hour plan. Had training practices before simulation including tabletops. Began with a mock WHO report and a fictitious newspaper story. Participants across the state then received 4 to 7 inputs per hour ranging from email interactions to test of currency of notification list to calls from citizens, etc.	following risk communication principles under time pressures of a realistic event than in a tabletop exercise. Tabletops do not capture psychological environment that a field simulation under time pressure can. Noted need to improvement message production skills, foster rapid access to materials, engage in better media monitoring, use more process talk in public messages.	
High et al., 2010	<i>Tabletop exercise.</i> Purpose: to allow functional heads of agencies and organizations that would be involved in or affected by a release of toxic chemical agents in North Carolina, U.S.A., to practice plans and procedures with interagency, intra-agency, and public-private cooperation and coordination. Part of a larger series of exercises: 2 discussion-based and 2 operations-based. This tabletop took place for a full day and was in 3 modules and focused on 3 critical points in the event.	<i>Mixed method.</i> Analyzed agencies on roster, administered post-exercise survey, observed debriefing at end of exercise. Not enough expertise at each table to provide all needed information. Concluded that it is important to recruit functional and operational leaders for this type of exercise, be sure questions promote action decisions, adjust discussions to promote both lateral and vertical interactions, allow time for in-depth discussion, have participants bring organizational preparedness plans, disseminate AARs to people involved	(MMAT) Low
Madden et al., 2013	<i>Needs and current practices assessment, content analysis of existing trainings.</i> Purpose: to inquire into communication channels respondents' organizations employ, hazards they communicate about, past training experiences, future training needs. Also to determine content of 173 ERC training programs in the U.S.A.	<i>Mixed method.</i> Descriptive results indicate although participants attended on average 2.1 trainings per year, they had an interest in more in-person training, and trainings for broader local communities. They also expressed interest in more "take-away" documents and template, more online or blended environments. Training content often not in line with expressed needs of experts, specifically in terms of social media training, delivery modality, targeting special and vulnerable populations training in evaluation.	(MMAT) Moderate
Morris, et al., 2012	<i>Tabletop Exercise.</i> Purpose: to promote cooperation among public health agencies and academic institutions in 7 southern states in the U.S.A., identify gaps in plans and policies, and identify unique contributions of academic institutions. Conducted in 9 hours over 2 days. Participants assigned to 1 of 4 multi-agency tables with others from same state. Exercise in 5 modules representing phases of an infectious disease	<i>Mixed method.</i> 6 designated evaluators. Moved from table to table. Filled out open-ended questions and checkbox tables. 22 participant surveys also collected with quantitative items plus 6 open-ended questions. Plus, After Action Reports. Participants overall agreed exercise was helpful and helped identify gaps in planning. ERC recognized as key component of preparedness. Players saw need to be prepared with a	(MMAT) Low

	outbreak at a university. Facilitator provided list of pre-scripted questions.	contingency press statement and saw academic institutions have untapped resources.	
Shao, 2014	<i>Online training program in ERC.</i> Purpose: to evaluate user perception of a training module translated into Chinese and adapted from CDC training. Survey focused on user perception of the training's content/design, readability, innovativeness, practicality/ applicability. Interviews focused in more detail on the users' experience of taking such an online training.	<i>Mixed method.</i> Participants answered yes-no questions about the training. They indicated the program was well-understood and applicable but thought face-to-face training would have long-lasting impact, which should include field instruction. They agreed training should be part of required in-service training with continuous education credit. Interview data offered additional support for these patterns.	(MMAT) Low
Wahl, et al., 2015	<i>Foodborne emergency functional exercise.</i> Purpose: to describe how elements of a nationwide exercise in Norway contributed to learning effect on organizations. Scenario was of a salmonellosis outbreak traced to nationally distributed cured salmon contaminated with <i>Salmonella</i> . ERC included. Role players for lab reps, epidemiologists, patients, GPs, restaurant representatives. Interviewed NFSA coordinator for foodborne outbreak and NFSA chief of contingency. Tested several new or revised operational systems.	<i>Case study.</i> Primarily evaluated by questionnaire. Surveyed all participants with 6-point Likert-type scale. Also, internal and external monitors observed and commented on course of play and reported on monitor questionnaires. Internet-based recording system labor-intensive and not suitable to maintain sufficient overview. 50% rated overall impression of exercise 5 or 6. External monitors said exercise well planned and engaging. Also, said some statements to media were not coherent with communication plans. Key personnel said exercise revealed need for more training in ERC.	(MMAT) Moderate
Quantitative Studies			
Carney, et al., 2011	<i>Simulation exercise.</i> Purpose: to describe and compare pandemic exercises used in four U.S. medical schools, discuss lessons learned, and suggest a framework for curricular development for medical schools considering addition of pandemic exercises to their population health curriculum. Handled differently at each school but preceded in all by a one-hour lecture. Exercises lasted 2 or 3 hours. Pandemic influenza scenario.	<i>Questionnaire.</i> Evaluation tool varied by institution. Lessons learned: initiate planning well in advance, involve state and/or local health departments, prepare students for logistics, roles, and responsibilities. Differences in timing afford advantages and disadvantages.	(Modified BMJ) Low
Dickmann, et al., 2015	<i>Training course.</i> Purpose: to develop competencies of public health program managers and practitioners in Europe to analyze, understand and apply risk communication concepts, principles and approaches to prevention and control of	<i>Questionnaire.</i> Post-course assessment not described in detail but 14 of 15 respondents said expectations had been fully met and 14 of 16 stated understanding of concepts and approaches had increased considerably. Overall appreciated that training was	(Modified BMJ) Low

	communicable disease threats. A 2-day training course based on idea that rather than providing detailed guidance and listing steps, better to provide participants with a map, the skills and literacy to read the map, and the ability to design own risk communication strategies for their own realities.	based on reflection and reframing rather than tips and checklists	
Friedman, et al., 2011	<i>Curriculum.</i> Purpose: to assess effectiveness of disaster preparedness communication curriculum for American public health graduate students' understanding and use of communication strategies for reaching vulnerable groups with preparedness messages. Training module on health and risk communication had goal of teaching students to apply principles of developing disaster messages for vulnerable, hard-to-reach or at risk populations.	<i>Pretest-posttest no control group.</i> Pretest-posttest 24-item survey with Likert-type responses from 1 to 6. Statistically significant increase in knowledge for 12 of 20 items. Majority of students were moderately to strongly satisfied with the module. Answers to qualitative items indicated students learned key principles.	(NHLBI tool) Low
Heide man, & Hawley, 2006	<i>Needs Assessment and Workshop.</i> Purpose: 1) to introduce agencies to best practices for risk communication message mapping, thereby facilitating a collaborative approach to preparedness and response, 2) to provide participants with skills needed to develop risk messages. Needs assessment and train-the-trainer message mapping workshop in Kansas, U.S.A.. Needs assessed done with 26 volunteers in 3 focus groups from a pool of 199 professionals recommended by KDHE. Follow-up 2-day workshop used role-playing, mock interviews, small group interaction, Q & A sessions to increase ERC knowledge.	<i>Pretest-posttest no control group.</i> 7-item pretest-posttest evaluation tool with 5-point Likert-type scale. Self-reported knowledge evaluated on risk communication principles and skills. Improvement demonstrated in knowledge about developing message maps, knowledge of other concepts, identifying underlying stakeholder concerns; identifying concerns specific to stakeholder group; developing scripted messages for anticipated questions; ensuring central repository of consistent messages; creating framework for all members of organization to speak with one voice.	(NHLBI tool) Low
Leaming, et al., 2013	<i>Computer simulation for decision-making in pandemic influenza response scenario.</i> Purpose: to introduce personnel to critical decisions involved in handling a pandemic influenza surge and assess their opinion of current preparedness at home institution in U.S.A. Used a Delphi process to finalize an 8-week scenario exercise. Begins with a pre-workshop session. Simulations took place in conference rooms within hospitals where participants could sit at a desk in front of a simulation computer.	<i>Pretest-posttest no control group.</i> 42-item pretest-posttest questionnaire assessing 7 success factors on a scale of 1 to 5. Post-simulation, trainees indicated a statistically greater likelihood of needing to improve their organization in terms of communication, incident planning, public information and training. They also recognized key factors requiring immediate attention at their home facilities. Some indicators moved downward.	(NHLBI tool) Low

Orfaly, et al., 2005	<p><i>Description of course: “Bioterrorism Preparedness and Response.”</i></p> <p>Purpose: to integrate practice and theory in an American public health graduate course and provide a model for the integration of a practice-oriented approach to preparedness into an academic curriculum. This course features lectures and an interactive tabletop exercise.</p>	<p><i>Questionnaire.</i> All students completed self-administered anonymous course evaluations on the last day of class. Most indicated the course was useful and they would recommend it to their peer. Also, looked at quality of student projects.</p>	(Modified BMJ) Low
Uddin, et al., 2008	<p><i>Formalized competency-based all-hazards curriculum.</i></p> <p>Purpose: to assess student perception of curriculum in U.S.A. Incorporates didactic learning, practicum sessions, a tabletop exercise, and a final integrating project. ERC component is how to talk to people in a disaster.</p>	<p><i>Questionnaire.</i> Mean overall student rating of the curriculum improved year by year. Students also gave positive qualitative feedback. External stakeholders evaluated projects as high in quality.</p>	(Modified BMJ) Low
Valesky, et al., 2011	<p><i>Tabletop exercise.</i> Purpose: to identify vulnerability in safety, security, communications, supplies, incident management, surge capacity.</p> <p>Conducted by SUNY in conjunction with 9 hospitals in Cape Town, South Africa in anticipation of 2010 FIFA World Cup. Simulated stampede and crush-type disaster at stadium. 10-week, scenario-based drill conducted by email. After each scenario was sent, hospitals had 3 days to collect answers and submit responses to drill controllers.</p>	<p><i>Questionnaire.</i> Questions were sent weekly. Focused on areas of disaster preparedness highlighted in the Hospital Emergency Analysis Tool. Contact persons were each responsible for hospital’s disaster plan. Used all resources necessary to answer questions as accurately and promptly as possible. Items encompassed 6 major categories of disaster preparedness. Also, hospitals’ call-down-lists were submitted as well as a detailed “Hazard Vulnerability Analysis.” Highest scores were in equipment, development of a major incident plan. Lowest scores were in public relations/risk communication.</p>	(Modified BMJ) High
Dausey, et al., 2006	<p><i>Tabletop exercises.</i></p> <p>Purpose: exercises focused on at least one of 3 related objectives: training, relationship-building, and evaluation. Lessons from 4 projects, including 31 tabletop exercises in partnership with state and local health departments across the United States. Designed with substantial collaboration with representatives from participating health departments. Focused attention on local preparedness needs and priorities. Exercises were 2 to 8 hours long, had 10 to 40 participants, different agencies attended, different disasters used, different levels of facilitator involvement.</p>	<p><i>Qualitative.</i> Tabletops benefit from collaborative planning with involved stakeholders from participating health departments and exercise developers and facilitators. The exercises identified both strengths and vulnerability in emergency preparedness, but additional work needed to develop reliable metrics to gauge exercise performance, inform follow-up action steps, and develop evaluation exercise designs to assess impact. ERC expertise was identified as needed to improve communication with vulnerable populations. Participants also completed questionnaire with structured and semi-structured questions but results of these were not reported.</p>	(CASP) Low

Qualitative Studies

Lurie, et al., 2008	<i>Tabletop exercises.</i> Purpose: to enhance Veterans Affairs facilities throughout the U.S.A. for planning and preparedness for pandemic influenza. A series of 6 exercises for facilities, regions, and the VA Central Office (VACO) piloted for use throughout the Veterans' Administration system. Involved a 3-step scenario about an unfolding pandemic. Exercise took 6 to 8 hours. Involved: VACO policy staff, Veterans Integrated Service Networks employees, representative, and individuals charged with coordination of VA health care system emergency response, and VHA senior leadership staff.	<i>Qualitative.</i> Immediately after each exercise RAND-VA team reviewed issues identified in exercise. Using checklist to guide discussion discussed strengths and weaknesses of participants' pandemic preparedness. Because reliable and valid scoring methods for tabletops have not been developed did not rate levels of preparedness for various sites. Also, conducted qualitative analysis of observer notes, hot washes, and AARS using content analysis. Found communication and coordination between VA system reps and local and regional emergency planners limited. Messaging inconsistent at community level.	(CASP) High
Malet & Korbitz, 2015	<i>6-month risk communication simulation.</i> Purpose: to investigate attitudes toward risk communication and emergency preparedness in Colorado, U.S.A. over time. Scenario had near-simultaneous release of anthrax spores in recreation area and also regional water supply, as well as foot and mouth disease virus at state fair. Time frame mirrored cleanup of 2001 anthrax attacks. People participated from own offices and spaces. Input via email.	<i>Qualitative.</i> Knowledge assessed by actions taken. Participants not necessarily familiar with best practices. State and local less prepared than federal employees and assumed they would be sidelined by federal officials in the event. Clear preference for reducing residential risk to zero even when that was disruptive. Respondents' sense of hopefulness/hopelessness about event affected response. Information on bioterrorism response should be provided to agencies that do not normally work in public health but would be involved in a crisis.	(CASP) Low
Sandström, et al., 2014	<i>Tabletop exercise to evaluate tool.</i> Purpose: to evaluate the tool. Presents a tool for chemical, biological, radiological, or nuclear releases. Risk communication was one component. Set of exercise cards presented and tested with 3 different groups of healthcare professionals of different sizes, nationalities, and background in Sweden and Europe.	<i>Qualitative.</i> Assessed qualitatively by 3 groups of emergency preparedness and healthcare professionals. It is important to have a highly professional exercise director, the concept is highly flexible, but works best with a smaller, homogenous group. In large and heterogeneous forums it can raise awareness. Overall a useful and flexible tool for simplifying tabletop exercises.	(CASP) Low
Savoia, et al., 2012	<i>After Action Reports.</i> Purpose: to analyze how lessons learned from the response to real-incidents may be used to maximize knowledge management and quality improvement practices such as the design of public health emergency preparedness exercises. Conducted a structured review of after	<i>Qualitative.</i> Suggest a nationally aggregated pool of AARs be used by practitioners. That way people do not need to relearn lessons from other people's exercise experiences. Multiple themes identified when analyzing content of AARs. Identified	(CASP) High

	action reports (AAR)s. Data source: "Lessons Learned Information Sharing (LLIS.gov)" system, a national, online repository of lessons learned, best practices, and innovative ideas in the U.S.A.	weaknesses in the way AARs are developed.	
Instrument Development Studies			
Palttala & Vos, 2011	<i>Measurement system with performance indicators for crisis communication in large-scale emergencies.</i> Purpose: to test the validity of the measurement system. The instrument was developed inductively by surveying experts. Contains 63 performance indicators (18 for preparation phase, 8 for warning, 20 for response, 12 for reconstruction, 5 for evaluation). Can be used to conduct a preparedness audit, test crisis communication plan, evaluate communication in a preparedness exercise or in actual crisis.	<i>Instrument development.</i> A series of interviews with experts in Finland revealed instrument looked useful and indicators were considered relevant and important but too many in number. Therefore, a possibility to use the instrument in 3 separate parts, relating respectively to the period before, during and after a crisis, should be offered.	(COSMIN Checklist) Low
Savoia et al., 2009	<i>Performance measurement tool for tabletop exercise participants.</i> Purpose: to assess reliability and validity of instrument. Instrument addresses 5 public health capacities: 1) leadership and management, 2) mass casualty care, 3) communication, 4) disease control and prevention, and 5) surveillance and epidemiology. Items tested in 3 tabletop exercises in Massachusetts and Maine, U.S.A.	<i>Instrument development.</i> Alpha coefficients were .81 or higher for all 5 domains. 5-factor solutions from principal components analysis accounted for 60% of total variance. Inter-rater agreement of expert evaluators good to high. The tool could be useful to provide a standard measure of effectiveness of Tabletop exercises.	(COSMIN Checklist) High

Table 3. Findings Synthesized Across Methodological Streams

Review Finding	Studies Contributing to Finding	Across Methods Certainty/ Confidence Evaluation of Synthesized Finding ¹
Emergency risk communication training should include a focus on coordinating federal, state, local, and community agencies and personnel. This message was consistent across a range of exercise and agency types, and is one of the most frequent themes appearing across methodological streams, though sometimes the point was made in after-exercise debriefings, when lack of collaborative opportunities was cited as a weakness of exercise design. This has been shown to be the case in U.S.-based studies with local, state, and federal health department participants. Levels of knowledge have been found in several U.S.-based studies to differ between local, state, and federal agencies. A few studies also added a focus on collaboration with community agencies, organizations, and leaders, although these actors were more commonly viewed as a target of communication rather than a partner. This type of collaboration has been urged in both tabletop exercises and more complex real-time simulations. The same may be true for multi-national exercises. There is evidence from the Middle East, Asia, and Africa that countries can work together to conduct successful exercises. In fact, participants in these nations gave feedback that more governmental sectors should have been involved in exercises.	Ablah, et al., 2007; Dausey & Moore, 2014; Dausey et al., 2006; Freimuth et al., 2008; High et al., 2010; Lurie, et al., 2011; Madden et al., 2013; Malet & Korbitz, 2015; Morris, et al., 2012	CERQual Multi-method studies: Moderate CERQual Qualitative studies: Moderate OVERALL: Moderate
Tabletop exercises and simulation for training can enhance awareness, readiness, and knowledge about emergency risk communication. It is important to note that the outcome measures in this theme are all self-reported; the most common measurement of success across the studies analyzed was simply asking participants if they thought they had benefitted from the experience. This finding has been reported in tabletop exercises in the U.S.A., Norway, Sweden, and in simulations in U.S. hospitals, medical schools. The same self-reported improvement has been demonstrated in multi-national exercises conducted across the Middle East, Asia, and Africa. In the Middle Eastern, Asian, and African countries, however, participants rated exercises lowest in revealing gaps in preparedness in their own agencies. A few qualitative studies used behavioral performance indicators rather than self-report measures, and a number used reports by trained observers. Little information is available about what characteristics make exercises successful, however. Among the few specific findings about key factors in successful training, an exercise involving 17 local health district risk communicators in Georgia, U.S.A., found that participants had much greater difficulty following risk communication principles under the time pressures of a realistic and stressful simulation than they did in a tabletop exercise. Participants did report highly enhanced awareness, readiness, and knowledge after the real-time simulation	Ablah, et al., 2007; Aertsen et al., 2013; Carney, et al., 2011; Dausey et al., 2006; Dausey & Moore, 2014; Dickmann, et al., 2016; Freimuth et al., 2008; Friedman, et al., 2011; High et al., 2010; Leaming, et al., 2013; Morris, et al., 2012; Sandstrom et al., 2014; Uddin et al., 2008; Valesky et al., 2011; Wahl et	CERQual Multi-method studies: Low GRADE: Very low CERQual Qualitative studies: Low OVERALL: Low

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but they also made many errors.	al., 2015	
Evaluation and training for emergency and disaster preparedness should include an emphasis on communication with the media. Because tabletops attempt to create a comfortable environment, inclusion of media may be perceived as threatening, but without it critical gaps in planning will not be revealed. Issues identified in U.S.-based exercises include: participants not always able to translate knowledge of principles into actions under time pressure; forgetting to include expression of empathy and using too much bureaucratic speech; media talking points not shared with hospitals and other agencies; participants not adequately monitoring media developments; notification lists often used indiscriminately and not usable by back-ups in their current format; departments waiting until they were contacted to start communicating with the public, meaning they often responded defensively and had trouble quickly formulating an initial message that was clear, informative, and alleviated anxiety. In South Africa, hospital preparedness for risk communication and public relations was found to be among the lowest preparedness of areas assessed. Evidence from Norway found training in media use was especially needed in head offices as opposed to regional and local levels, perhaps because those offices have a more complex task and are more concerned with strategic and political aspects of media relations.	Carney, et al., 2011; Dausey et al., 2014; Dickmann et al., 2016; Freimuth et al., 2008; Friedman et al., 2011; Heideman & Hawley, 2007; High, et al., 2010; Leaming, et al., 2013; Malet & Korbitz, 2015; Morris, et al., 2012; Valesky, et al., 2011; Wahl, et al., 2015	CERQual Multi-Method studies: Moderate GRADE: Very low CERQual Qualitative studies: Low OVERALL: Low to Moderate
Training should include preparation for designing messages to be communicated to the media that are sensitive to audience needs and comprehension. An exhaustive review of risk communication training programs in the U.S.A. found little training is devoted to meeting the informational needs of special needs and vulnerable populations even though risk communication experts recommend this as a priority. This issue was generally a secondary rather than a primary theme in other studies, and appeared only in U.S.-based trainings. It was briefly mentioned in medical school and graduate public health curricula. Local health departments in various U.S. states have expressed uncertainty in exercises about how to effectively communicate with vulnerable or underrepresented population groups in their jurisdictions. Some did not even have language capabilities to communicate with these groups. In the U.S., rural populations were sometimes considered to be special needs. Both federal and state officials had difficulty working with rural populations, who have been found to be less receptive to what they view as external interventions.	Carney, et al., 2011; Dausey et al., 2014; Dickmann et al., 2016; Freimuth et al., 2008; Friedman et al., 2011; Heideman & Hawley, 2007; Madden, et al., 2013; Malet & Korbitz, 2015	CERQual Multi-Method studies: Low GRADE: Very low CERQual Qualitative studies: Low OVERALL: Low
Typical After Action Reports in the U.S. use vague, non-specific statements about exercise failure areas and lack root causes analysis of response challenges. They are also typically accessible only in the immediate geographic region. All of this makes it difficult to aggregate lessons learned from this type of training to other agencies. Although only 1 study investigated this issue specifically, authors of another study reached the same conclusion after assessing their own results. Both concluded that it would be helpful to ensure	Malet & Korbitz, 2015; Savoia, et al., 2012	CERQual Qualitative studies: Low OVERALL: Low

that compilation reports of best practices are actively disseminated to local government agency heads and public information officers, although the outcome of doing so was not tested.

Little current training is offered in blended online and face-to-face formats even though ERC experts largely called for trainings that combine online and offline delivery methods. Only 1 out of 173 trainings content analyzed in the U.S. was presented in a blended format. However, we observed mixed modal formats in the graduate level disaster preparedness courses. Yet format may make a difference. Participants in an online training program in China expressed a strong preference for face-to-face training.	Madden et al., 2013; Shao, 2014	CERQual Multi-method studies: Moderate OVERALL: Moderate
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Few current training programs in ERC included instruction on use of social media even though nearly half of risk communication experts reported having that type of training. Only 6.5% of trainings analyzed included a unit on using social media to communicate with the public. This is confirmed in a 6-month exercise involving federal, state, and local agencies in the U.S.; many state and local officials were not familiar with social media platforms or did not find them relevant to their job roles. Most studies did not mention social media one way or another, which may be an indication that it had a low or non-existent priority for exercise facilitators.	Madden et al., 2013; Malet & Korbitz, 2015	CERQual Multi-method studies: Moderate OVERALL: Moderate
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Only a minority of risk communication training is hazard-specific, even though the overwhelming majority of experts agree that messages should differ by hazard type. This description of the state of U.S.-based emergency risk communication was derived from an exhaustive analysis of content of existing training programs. Concern that messaging differs by hazard was a driving factor in the development by a group of Swedish researchers of a tabletop exercise tool using cards which specifically dealt with threat posed by releases of chemical, biological, radiological, or nuclear	Madden et al., 2013; Sandstrom, et al., 2012	CERQual Multi-method studies: Moderate OVERALL: Moderate
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Few training programs include training in evaluation. This was reported both by experts interviewed and also observed in trainings analyzed. This theme emerged only in the multi-method stream, however single studies in other streams and the presence of two instrument development articles also reinforce the point. The paucity of evaluation tools has been noted not only in the U.S., where most studies have been conducted, but also in the Middle East, Asia, and Africa. One particular aspect of lack of evaluation noted is that U.S. local and state health departments were found to have identified gaps in preparedness in previous studies but never have addressed them after the exercise ended because of lack of time, or lack of knowledge about how to make changes. Authors of two U.S.-based studies assert that exercises should always conclude by having health departments prioritize challenges identified and create action plans to address up to 3 of them.	Dausey et al., 2006; Dausey & Moore, 2014; High et al., 2010; Madden et al., 2013; Palttala & Vos, 2011; Savoia, et al., 2011	CERQual Multi-method studies: Moderate OVERALL: Moderate
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¹GRADE principles were adapted for application to descriptive quantitative studies and GRADE CERQual principles were applied to mixed-method studies. Neither adaptation has been approved by the tool originators.